



# STATE OF NEVADA

Department of Conservation & Natural Resources

DIVISION OF ENVIRONMENTAL PROTECTION

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## NEVADA MERCURY CONTROL PROGRAM BRIEFING DOCUMENT

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### Background:

Mercury (Hg) is a naturally occurring, geologically concentrated metal that is often associated with volcanic activity, gold deposits and geothermal springs. Mercury cycles extensively in the environment and, once in the atmosphere, is transported globally, regionally and locally. Because of its geology, Nevada is home to large areas of naturally occurring mercury.

Anthropogenic (human caused) sources of mercury emissions into the air include coal combustion primarily from electric generating plants and cement kilns, hospital and municipal waste incinerators, thermal treatment of ore in precious metal mining, geothermal heat recovery, and historic mining releases.

Mercury from natural and anthropogenic sources that enters our oceans, lakes and rivers is converted to methyl mercury by aquatic organisms and bioaccumulates in fish and shellfish. According to the National Research Council's Committee on the Toxicological Effects of Methylmercury, the primary route of human and wildlife exposure to Hg is through the ingestion of contaminated fish, particularly large predatory species. Exposure through inhalation is extremely rare and typically associated with industrial exposure of employees that work directly with mercury.

Prior to 1998, mercury releases from precious metal mining had not been systematically measured by any state or by the federal government, and emission estimates from the industry were not available. In 1998, the Toxic Release Inventory (TRI) was changed to require the mining industry to report its mercury emissions. The 1998 report was released in 2000. Through this revised federal reporting mechanism, Nevada mines were found to be a very large source of mercury emissions. The TRI did not require a source to actually test a process or otherwise directly sample for air emissions, but rather to provide an estimate based on available information.

Although it may have been possible to establish a federal program to regulate mercury emissions from the mining industry, the Division, US EPA and the industry knew that the process would be lengthy and reductions would not be seen for more than a decade. So, in recognition of the hazards posed by mercury and the fact that no federal requirements existed for controlling mercury from this industry, the Voluntary Mercury Reduction Program (VMRP) was initiated in 2000. This program was developed jointly by the US EPA, the Division and the four mining

companies with the largest reported mercury releases. The program was finalized in February of 2002.

The goals of the VMRP were to (1) achieve significant, permanent and rapid reductions in mercury air emissions from gold mining operations; (2) achieve reductions through approaches most suitable for each individual mining facility; and (3) to encourage flexibility in technology innovation and greater reductions per transaction cost.

This program was very successful. Significant reductions in mercury emissions occurred within the first two years, and continued throughout the term of the voluntary program due to the installation of new mercury emissions controls, the optimization of existing controls, and the development of new control technology.

As part of the original VMRP, the Division committed to review the voluntary program at the end of 5 years - to evaluate its successes and shortcomings. In the fall of 2004, the Division began evaluating the VMRP program and considering enhancements. After a number of meetings with the industry, environmental groups, and US EPA, the Division decided to move from a voluntary to a regulatory program. The Nevada Mercury Control Program (NMCP) was designed to build on the successes of the voluntary program and would:

1. Expand the program to all precious metal mining facilities (Although the VMRP companies represented over 90% of the mercury emissions based on TRI reporting, there was concern that other facilities may have mercury emitting units that should be regulated);
2. Ensure that the mercury emissions data being reported was accurate and verifiable (The VMRP did not establish specific data collection and reporting requirements which led to confusion and the concern about the accuracy of the reporting);
3. Ensure that existing controls would continue to be operated (i.e. a facility that had volunteered to put on controls could not then decide to stop operating them) and that the controls were being operated at their maximum efficiency;
4. Establish Maximum Achievable Control Technology (MACT) for all of the individual processes with the potential to emit mercury; and
5. Require the installation of MACT controls on all sources with a potential to emit mercury and establish enforceable operating, maintenance, testing, reporting and emission requirements through a permit.

## **1. Expanding the Program to All Precious Metal Mining Facilities**

In order to determine that all of the mercury emitting processes were covered by the regulatory program, a questionnaire, developed by the Division and US EPA (Regions 9, 10 and Headquarters), was sent to all of the precious metal mining operations in Nevada. The purpose of the questionnaire was to gather accurate information regarding the number of facilities that have thermal treatment units that may emit mercury, the number of facilities that may be planning to add thermal units and the nature of any existing mercury controls. In addition, the Division expected to receive sufficient information to determine whether or not there were thermal units with such small mercury emission rates that they could be considered

insignificant. The Division had also planned to use this information to establish a de minimus level, below which no mercury controls would be required.

In January of 2006, over 50 questionnaires were sent to precious metal mining facilities in Nevada. Based on the information reported, the Division determined that approximately 19 mining operations have existing thermal processes with the potential to emit mercury. With respect to establishing a de minimus level, this data did not provide enough detail to establish such a limit, so no mercury emitting units were initially exempted from the program.

As is true with virtually all of the other aspects of the air program, the facility responsible for the emissions is required to do the initial round of data collection and submit the information to the Division. We do not, however, merely accept this information at face value. There is always significant review and auditing that takes place, and that review can take a number of different forms. Often it means that we will be conducting unannounced, on-site inspections. Inspections occur at each facility on a regular basis, but in addition, we can, and do, conduct inspections designed to evaluate very specific information, in this case the information reported on the mercury questionnaire.

Once the questionnaires were received and evaluated, the Division has been conducting, and will continue to conduct, unannounced inspections of all of the facilities that reported to determine whether or not the information submitted was complete and accurate, starting with the largest emitting sources. These inspections also provided the agency with independent identification and inventory of the thermal units located at these facilities that must be included in any permit application prepared by the facility operator. Requests for information are made under specific regulatory and statutory authority and failure to report accurately is a violation and will result in appropriate enforcement action.

## **2. Ensuring Accurate Emissions Reporting**

As described above, the VMRP did not establish a basis for mercury emissions reporting, nor did it require a specific emissions measurement methodology. To address these shortcomings, one of the methods the NMCP requires is specific mercury emissions testing, the results of which are to be used for mercury emissions reporting. Any testing required to be conducted under this, or any other, aspect of the air program must adhere to the following procedures:

1. The testing must be conducted by an independent, third-party emission testing firm that specializes in air emission sampling techniques;
2. A testing protocol must be submitted to the Division at least 30 days in advance of the test and must be approved by the Division before the testing can be conducted. The test protocol must include a detailed description of the test method to be used, the operating conditions under which the test will be run (i.e. maximum fuel combustion, production rate or ore processing rate) to ensure that the results obtained represent the highest expected emissions rate and are representative of the maximum operations of the equipment being tested. The testing must be conducted at the fuel consumption rate, production rate and/or heat input rate, if applicable, that is established in the permit. In addition, known Hg reference samples, provided by US EPA Region 9 have been submitted along with the mercury emissions test results from each testing firm, as an audit all laboratory analyses conducted on the mercury samples collected. Any deviation

from an established EPA test method must be approved in advance or the testing is not considered valid, and any failure of the laboratory analyzing the mercury audit sample appropriately will render the analysis void;

3. The test must be scheduled at least 30 days in advance to allow the Division to have an inspector observe the test. This ensures that sampling is being conducted in accordance with the approved protocol and that the appropriate equipment is being used; and,
4. After the test is completed, a final report is prepared by the contractor and submitted to the Division with throughput and other operating conditions, and any material sampling data required to be collected under the approved protocol. This includes hourly documentation of fuel consumption, throughput and the heat input rates during the source test as well as an analysis of the ore and its mercury content. This report and the supporting data are evaluated by the Division's compliance staff to again ensure that the protocol was followed, emission rates are calculated correctly and the results conform to all applicable standards including any limits established in a permit.

If any testing fails to follow the established protocol or does not comply with permit limits, the Division will take appropriate enforcement action. Typically the facility will be ordered to retest, violations will be issued and appropriate penalties assessed. All of the units that were part of the Voluntary Mercury Reduction Program (VMRP) were required to be tested and the reports submitted to the Division by December 31, 2006. Division compliance staff is currently reviewing these reports. These units were to be tested first because, collectively, they generate most of the mining industry's mercury emissions.

The NMCP requires emissions testing to be done annually. However, the first round of testing was designed to answer a very specific question - What is the form of the mercury being emitted by the various thermal processes? It has been shown that the type of mercury being emitted into the atmosphere (elemental, reactive gaseous, or particulate) affects the deposition rate. Particulate and reactive gaseous mercury are thought to fall out of the atmosphere more quickly and can have impacts more locally and regionally, while elemental mercury enters the global mercury pool and may not be deposited for years. When the VMRP was established in 2000, it was thought, based on process chemistry and the current state of the science that most if not all of the mercury being emitted from the mining industry was elemental, but no direct testing had been done. Given the concerns raised by environmental groups in Utah and Idaho, the first round of testing required under the new regulatory program was designed to speciate the mercury emissions. Based on US EPA guidance, we relied on a method called Ontario-Hydro for this round of testing.

Our mercury program currently requires annual testing of each permitted unit to determine compliance with the regulations and the facility's permit conditions. Continuous Emission Monitoring Systems (CEMS) for total mercury are not yet available for the types of processes used in the mining industry. Emissions testing is the most prominent federally recognized approach used to determine process emissions throughout all aspects of the federal air program, whether facilities are testing for the emission of criteria pollutants or air toxics. Emissions testing is not a random snapshot in time, but rather it is designed to represent maximum emissions generated from a process and to ensure that even at maximum operational rates, permitted emissions limits will be met on a continuous basis. Conducting emissions tests on an

annual basis, along with all other parametric monitoring (described below), collectively provides a basis for routine evaluations of process emissions.

EPA has been working for years with the power industry on the development of mercury standards and mercury CEMS to continuously measure and record mercury emissions. It is anticipated that CEMS may be available for installation at power plants in 2010. We are committed to tracking the development of this new monitoring technology and requiring its installation in appropriate applications as the technology becomes feasible and reliable. US EPA approved mercury CEMS are currently only capable of measuring only a portion of the mercury emitted from processes (gaseous portion) and not the total mercury emitted.

Along with annual testing, other operational and pollution control equipment parameters are required to be monitored and recorded to ensure proper operation. This additional parameter (parametric) monitoring provides more continuous data to ensure that a process is operating in a manner that is consistent with that of the emissions test. These additional monitoring parameters can be of many different forms, and conform to the specifics of the type of process and emissions control technology utilized. Some common examples include the measurement of throughput rates (ore processed), fuel consumption rates, and fuel analysis, all of which are directly related to the amount of emissions produced from a process. Pollution control device monitoring parameters can include measurements of the gas flow rates being sent to a control, the amount of pressure drop across the control (indicates pollutant loading within the control) and routine maintenance of the control device and any consumable or collection materials associated with the control. All of these parameters are routinely audited through routine inspections and evaluations of reporting criteria.

### **3. Ensuring that Existing Controls at VMRP Facilities Continue to be Operated**

All of the companies with existing mercury emission controls are required under the NMCP to obtain an operating permit for each of those controls. This permit will identify each mercury emitting unit and establish verifiable and enforceable operating and maintenance, monitoring, recordkeeping and reporting criteria. The VMRP companies were required to submit permit applications for each of the mercury emitting units that had been part of the voluntary program first. Facilities with mercury emitting units that were not part of the VMRP received an additional 3 months to gather the necessary information and submit their applications. All of the information included in the application is reviewed and independently verified by Division permitting and/or compliance staff.

By permitting the existing controls their continued operation is no longer voluntary. As with all emissions controls required under a regulatory program, emissions controls must be operated at all times. The permit establishes enforceable criteria that are designed to ensure the maximum degree of emissions reduction. Failure to operate and maintain required controls properly and continuously, will result in appropriate enforcement actions that may include complete shutdown of the process.

Prior to the issuance of all mercury control operating permits drafted by the Division public notice is required. The NMCP established this criteria to ensure that all information and determinations made by the Division are made available for review by interested persons. This mechanism allows the Division to consider any additional comment and make any necessary revisions to the draft permit prior to final permit issuance.

#### **4. Establishing Maximum Achievable Control Technology (MACT) for all Mercury Emitting Units**

The NMCP requires that a MACT determination be conducted by each facility for every applicable (non-de minimus) thermal unit at a facility. The analysis must be submitted as part of the facilities application and must conform to specific evaluation criteria that is consistent with the federal MACT determination process. Division permitting staff must evaluate each MACT determination independently to determine if the proposed control technology truly constitutes the best controls available to control mercury emissions from the respective thermal process. This process also requires the Division to establish a clearinghouse for data from each of the mines so that appropriate comparisons of process and emissions controls between the mines can be conducted. This will ensure consistent evaluations of control technology within the industry.

As new thermal processes are introduced at the facilities, or as existing units are modified, the process is repeated. This ensures that the control technology does not become outdated and continues to push additional mercury reductions as the control technology improves.

#### **5. Require the Installation of (MACT) Controls on All Sources**

Once the Division completes the MACT evaluation, the control technology must be incorporated into a permit along with a corresponding maximum mercury emissions rate. The permit is again made available for public comment. After consideration of comments received, a final permit is issued. Consistent with all other permitting in the air program, the MACT permits must contain conditions that require the installation and continued operation of the required mercury control technology, as well as maximum mercury emissions limitations and enforceable requirements to ensure compliance.

In summary, it's important to note that the Nevada Mercury Control Program is the first of its kind in the nation. Although based on tried and true approaches used for years by U.S. EPA and other states, the program's implementation is still a dynamic work-in-progress. As with any ground-breaking program, it is subject to constant evaluation, adjustment and fine-tuning as we move forward. We are confident, however, that its provisions, when considered in total, will ensure that the programs major objectives will be met, including: independent data gathering and verification; independent oversight, inspections and testing; as well as enforcement and penalty provisions for any violations that might occur. In short, the program ensures accountability at every step in the regulatory process.

We believe that, given time to work, the program will achieve our overall goal of further reducing mercury emissions from precious mines in Nevada.